STRATEGIES TO IMPROVE BALI CATTLE IN EASTERN INDONESIA

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Options for Genetic Improvement of Bali Cattle — Assessing the Strengths and Weaknesses of Alternative Strategies

Option 4. Basic breeding system with limited selection options

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Abstract

This paper discusses breeding programs for Bali cattle that could be practicable and economically feasible under Indonesian conditions. It assumes that there are constraints that preclude the widespread use of artificial insemination, that there will not be the opportunity or the information to carry out sophisticated analysis of data and that selection is restricted to within (and not between) management groups. Simple practices such as measuring girth diameter as an estimation of weigh might replace scales, which are probably not readily accessible anyway.

It is concluded that simple techniques of identification and recording can be used in an effective breeding system provided that certain basic guidelines are followed by the farmers and the agents who advise them.

Introduction

BREEDING programs with intensive recording (pedigree and performance data) could be too difficult and too expensive as a first attempt to develop a sustainable breeding program for Bali cattle, since the initial and ongoing financial investments and required infrastructure might not be available. In this paper I will therefore discuss options that might be used in some sections of the cattle population or across all cattle to bring about some genetic progress.

Some Assumptions

To discuss a breeding system with any form of selection it is necessary to identify the breeding objective. Without knowing what you want to improve there is no logic in recording anything to make selection decisions. The only reasons for recording would be to document the current level of performance and for management purposes in larger breeding units.

I assume that we would like Bali cattle to grow faster and bigger and that we do not want them to loose their environmental adaptation. We cannot use AI for most cows and hence multiple-sire joining will occur in most village herds, so that sire pedigree will be commonly unknown. Under these conditions, the use of Best Linear Unbiassed Prediction (BLUP) technology or contemporary comparisons (CC) is not possible. Selection has to be practised within management groups, and cannot be extended across them. So we will have to restrict selection to the village level. However recording at village level should ensure that we maintain adaptation, as less-adapted females will reproduce at a slower rate and less-adapted bulls might grow slower.

I have also assumed that it is possible to castrate male calves early and that castration is a common practice. If early castration can be practised, birth weight and body measurements shortly after birth will become a useful tool for selection between very young (<3 months) bull calves. Analysis of Indicus, Taurus and Buffalo data have shown that very early body measurements and weight records are sufficiently genetically correlated with yearling and later

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weights (they are often higher than weaning weight correlations) to be useful for genetic evaluation and subsequent selection for larger mature size and faster growth (Meyer et al. 2000; Burrow 2001). This however needs to be verified for Bali cattle.

Recording Males

Recording weight and/or some body measurements (e.g. heart girth, hip height and cannon bone length) of every male calf using portable hand-held scales and simple measuring tapes within the first week of life should be possible. Calves should be identified with ear tags to make possible culling (castration) of half of the smallest and lightest calves say every three months, assuming there is no distinct calving season. If any data on age-of-dam effect (perhaps only year of birth) and season are available, calf records can be pre-adjusted. If those data are not available, implementing a recording system with the necessary details will provide such information after a couple of years.

A second culling stage has to be implemented when young bulls are eighteen months to two years of age. Such bulls should have been managed together at village level separately from any heifers and cows. Selection criteria at this stage could include weight (if transportable scales are available) and body size records, testicular size, heat tolerance test — all adjusted for age differences if necessary — and if available, a score for functionality. It is important to clearly specify how much weight has to be given to each selection criterion, and one should rely as much as possible on objective records.

A simple selection (SI) index of animal i combining the information on n traits can be calculated as

$$SI_i = \sum_{j=1}^{n} b_j \ (x - \bar{\xi} j)$$

The weighting factors b_j are dependent on the parameters (heritability, genetic and environmental correlations) of the records and the economic weights. With a computerised recording system these indices can be calculate very quickly for all animals in a management group.

Use of Bulls

To avoid inbreeding, selected bulls from one village should be sent to another village in a very planned and systematic way and used for only two years. This will ensure that no father–daughter matings will occur and that a relatively short generation interval can be achieved (see for example Trinderup et al. 1999 and Villanueva et al. 2000). If exceptional sires can be identified at village level, they could be later used for AI or moved to another village. Bulls not selected should be castrated if required for draught purposes, or slaughtered.

Data Collection

Data recording at village level needs to be undertaken by trained and responsible staff and not by individual farmers (animal owners). These staff should be equipped with the required hardware (hand-held scales and measuring tape) and also be responsible for tagging all calves (male and female) and, in early years, all cows. Included in their responsibilities is data transfer to the 'central management unit'. Depending on the number of cows in a village and distances between villages, one trained person could service more than one village and could also provide other livestock services, e.g. AI, nutritional advice, veterinary assistance and castration.

Data Management

Although the performance recording system described is very simple it is essential that the collected data be recorded on a central computer, though it might be necessary to use paper as interim records. Such central processing will allow the use of mass selection indices (a combination of different traits of a single animal) and, as time progresses, will lead to an integrated pedigree performance database once the AI records, which already exist, are added.

Selection of Females

Without a clear knowledge of reproduction rate and replacement requirements it is difficult to develop any recording system for females. The simplest system might be to tag only female calves and record birth data, to mate every reasonably grown heifer at say 18 to 24 months of age, and to slaughter all those who do not calve within 12 months. If progeny records are related to females it might be possible after a number of years to identify highly productive animals (regular calving and fast-growing male progeny) to select as élite cows, which might be specially used for AI with the very best bulls, or which could be transferred to a nucleus herd.

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